

VII. *Some Thoughts and Experiments concerning Electricity*, by J. T. Desaguliers, LL. D.
F. R. S.

THE *Phænomena* of Electricity are so odd, that though we have a great many Experiments upon that Subject; we have not yet been able from their Comparison to settle such a Theory as to lead us to the Cause of that Property of Bodies, or even to judge of all its Effects, or find out what useful Influence Electricity has in Nature: Though certainly, from what we have seen of it, we may conjecture, that it must be of great Use, because it is so extensive.

Though some Persons have been too hasty in their Conjectures, and too apt to run into Hypotheses not sufficiently supported by Experiments; yet it would be of great Use to settle some general Propositions concerning Electricity from the Light we have already, and what we may further discover by future Experiments; provided we have a sufficient Number of them to settle a general Rule. For Example; I now propose some general Assertions to be consider'd, and to be rejected or allowed of as a Number of Experiments shall determine; but to stand only as *Queries* till they are settled.

I have hitherto avoided entertaining the SOCIETY upon this Subject, or pursuing it so far as I might have done, (considering that I can excite as strong an Electricity in Glass, by rubbing it with my Hand, as any body can) because I was unwilling to interfere
with

with the late Mr. *Stephen Gray*, who had wholly turn'd his Thoughts that way; but was of a Temper to give it intirely over, if he imagin'd, that any thing was done in Opposition to him. But now I intend not only to go on myself in making electrical Experiments, but shall always be ready to make such as shall be propos'd by any Member of the SOCIETY. The *Queries* which I have already examin'd, are the following:

Query I. Whether all Bodies in general are not capable of receiving the Electricity which has been given to a Tube by Friction, though there be a great many Bodies, such as Metals and Vegetables, &c. in which we have not hitherto been able to excite any Electricity by Heat, or Friction, or any other Operation on the Bodies themselves?

Query II. Whether when a String is stretch'd out at Length, with a Body hanging at one End of it, to which Body we would communicate the Electricity of the Tube rubb'd at the other End, the Supporters of the String ought not to be of such Bodies as are capable of having Electricity excited in them by Friction, Heating, Beating, or Patting, or some immediate Operation on the Bodies themselves?

Query III. Whether these Supporters of the String (mention'd in the last *Query*) which stops the electrical Virtue from passing any farther, are not of such a kind as are incapable of having the electrical Virtue excited in them immediately by any Operation yet known; though they are all capable of receiving it from a rubb'd Tube, even at a great Distance, by the Communication of a String made of vegetable Substances?

Query

Query IV. Whether the Reason that some Supporters transmit the Electricity running from the rubb'd Tube along the String to Bodies beyond them, be not as follows, *viz.* That having receiv'd some of the electrical Stream, they soon become saturated with it, and so receiving no more of it, let the rest pass on without disturbing it?

Query V. Whether the Reason, that Supporters made of vegetable Substances, Metals, and such others, as stop the Electricity above-mention'd from running any farther along the String than the Place where it rests upon them, be not this? *viz.* That they are never saturated with the electrical Stream, but continually receive it, and transmit it to the next contiguous Body, provided that contiguous Body be of the same kind with themselves, and also contiguous to other Bodies of the same sort: I mean such as would stop the Electricity, if the String was supported by them. For even these Supporters will transmit the Electricity, if terminated at each End by Bodies that transmit the Electricity, when they support the String.

Query VI. Whether we may not distinguish all Bodies in general, in respect of Electricity, into such as may be excited to Electricity, and such as cannot be excited to Electricity? the two kind of Bodies receiving the Electricity from other Bodies into which it has been excited differently; the first also transmitting the Electricity, while the others do not.

These *Queries* are such as arise from a Consideration of Experiments made by others, and such as I have made myself.

As

As I go on in making other Experiments, other *Queries* may arise, and I shall communicate them.

Here follow the Experiments I have already made, and am ready to repeat as the SOCIETY may desire.

EXPERIMENTS *relating to the First Query.*

I stretch'd a Cat-gut about five Feet in Length, and fasten'd it to the Top of two Chairs in an horizontal Situation, and such another Cat-gut String to two other Chairs parallel to the first, and at the Distance of 15 or 20 Feet from the former. Then I suspended one End of a Packthread to the Middle of the first Cat-gut, and carried it on so as to lay it over the Middle of the other Cat-gut, and leave the other End of the Packthread hanging down about a Foot below the Cat-gut; with a Loop to hang several Bodies to it, successively to receive the Electricity excited by the Tube, and applied to the other End of the Packthread.

All the Bodies I tried received the Electricity communicated from the rubb'd Tube along the String, which appear'd by holding a Thread fasten'd to a Stick, the Thread being attracted towards the suspended Body

1. A Gold Medal. 2. A Silver Medal. 3. A Copper Medal. 4. A Brass Ball. 5. A Steel Ball. 6. A Tin Ball. 7. A Leaden Ball. 8. Sulphur. 9. Sealing-Wax. 10. Pumice-Stone. 11. Bees-Wax. 12. Resin. 13. *Sal Armoniac*. 14. Ivory. 15. Human Bone. 16. Fish-Skin. 17. Loadstone. 18. Flesh. 19. Cotton. 20. Wax-Candle. 21. Tallow-Candle. 22. A Leak. 23. Celer. 24. Tobacco-

bacco-Pipe. 25. A Glass-Ball. 26. A Rust rolled up.

EXPERIMENTS *relating to Query II.*

Retaining the first supporting String of Cat-gut, instead of the last Cat-gut Supporter, I made the Packthread pass over the following Substances successively, all which transmitted the Electricity to the Body suspended at the End of the Packthread; *viz.* 1. A Silk String. 2. Hair Rope. 3. Parchment. 4. A Thong of Sheep-skin, but it stopp'd the Electricity till it was dry and warm. 5. A List of Woollen Cloth. 6. A List of Flanel. 7. Cadis, or a kind of Worsted Tape. 8. Quills. 9. Whalebone. 10. A Man's Thigh-Bone. 11. A Bladder. 12. A Cat, held between two. 13. A Tallow-Candle. 14. A Wax-Candle (the String was also laid over the unburn'd Cotton Wick at the End of the Candle). 15. A Tallow-Candle and its Wick. 16. Tobacco-Pipe, with a Cat-gut or a Packthread through it, or without, that is, a Packthread String being fasten'd at each End of it. 17. A Sword-Belt. 18. A Piece of a white Hat. 19. A Piece of a black Hat. 20. A Glass Tube. 21. The same with Water in it. 22. With Spirit of Wine. 23. The same with Mercury in it. 24. Sealing-Wax. 25. Crape.

N. B. All these Substances, except the Sheep-skin, the Tobacco-Pipe, the Quills, the Candles, and the Bone, not only transmitted the Electricity, but became so far electrical, as to attract the Thread a little way on each Side of the supported Packthread.

There are more Experiments requir'd to be made, before this *Query* can be turn'd into an Assertion.

EXPERIMENTS relating to *Query III.*

Instead of the last Supporter of Cat-gut near the suspended Body, I made use of the following Substances stretch'd from Chair to Chair; and then the Thread hanging on the Stick was not at all attracted by the suspended Ivory Ball, which I made use of in all the Experiments to try the Supporters.

1. A Hempen Rope. 2. A small Packthread. 3. A drawn Sword. 4. A Sword in the Scabbard. 5. The Scabbard without the Sword. 6. A twisted Cotton Thread. 7. Tape made of Thread. 8. Bars, Tubes and Wires of Copper, Brass, Iron and Lead. 9. White Paper and brown. 10. A moist Thong of Sheep-Skin. 11. Celeri. 12. Leeks. 13. Fir-wood. 14. A Cane. 15. A Piece of black Thorn. 16. The same Rushes that had before receiv'd the Electricity when suspended. 17. A Sponge dry. 18. White Thread. 19. Hay. 20. A Marble Slab.

N. B. Such Bodies as were too short to reach from Chair to Chair, were lengthen'd out by Pieces of Packthread at each End.

EXPERIMENTS relating to *Query IV.*

The Cat-gut Supporters, and all the others mention'd in the Experiments to *Query III.* which transmitted the Electricity, attracted the Thread of the Stick near the conducting Packthread, but not so far as the Chairs to which the said Supporters were fasten'd.

EXPERIMENTS relating to Query V.

All the Supporters which did not transmit the Electricity, when they reach'd from Chair to Chair, were made to transmit, when they were lengthen'd out with Cat-gut at each End, and then they became electrical themselves from one End to the other, as becoming part of the suspended Body; and becoming so saturated, as not to be able to carry the Electricity on either Side any farther than the Cat-gut to which they were fasten'd.

EXPERIMENTS relating to Query VI.

The late Mr. *Stephen Gray* has, by rubbing, excited Electricity in several of those Bodies which I have made Supporters of to transmit the Electricity (See *Philosoph. Trans.* N^o 366.): I have done the same with several others, but not with all of them, though I shall try them all: But as it is more difficult to excite that Virtue in some than others; and all the Experiments in general succeed better in dry and cold Weather than in moist and warm, I must wait for proper Opportunities to make the Experiments, and then I shall communicate them.

EXPERIMENTS concerning mix'd Substances.

1. Cadis (or Woollen Tape) laid on Thread-Tape, when made a Supporter, transmitted the Electricity.
2. When the Thread-Tape was uppermost, the Electricity was stopp'd.
3. When they were twist'd together, the Electricity was transmitted, but most weakly when the Pack-thread

thread going to the Ball was laid over that Part of the Twist which had the Thread-Tape.

N. B. The two Paper Supporters which did not transmit the Electricity, ought to have done it according to *Query II.* because, by Mr. *Gray's* Experiments, Electricity is to be excited in the Paper by rubbing: Therefore, perhaps, the Papers wanted to be drier or warmer, so that I shall try them again. These are the only two Experiments that do not agree with the second *Query*; but I would not omit mentioning them, because it is the Part of an impartial Philosopher to mention as well those things which favour, as those that disagree with his Hypotheses and Conjectures.

VIII. EXPERIMENTS *made before the*
ROYAL SOCIETY, Feb. 2. 1737-8. by
J. T. Desaguliers, LL.D. F.R.S.

N. B. **I**N the following Account, which is the Sequel of former Experiments, I call *Conductors* those Strings, to one End of which the rubb'd Tube is applied; and *Supporters* such horizontal Bodies as the *Conductor* rests upon.

EXPERIMENT I.

Old Packthread Supporters transmitted Electricity but weakly, though more strongly when twisted with Cat-gut; but new Packthread did better.

N. B. Where it is not mention'd otherwise, an Ivory Ball hangs at the End of the Conductor;